OCEAN GALES AND STORMS

Vessel	Voyage		Position at time of lowest barometer		Gale began September	Time of lowest barometer September	Gale ended September	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′									
Abangarez, Am. S. S.	Charleston	Boston	33 54 N.	74 36 W.	[1] 31	1a, 1	1	1,005.8	N	WNW, 9	W	WNW, 9	NNW-W.
Dungannon, Am. S. S.	Port Arthur	Providence	35 50 N.	73 45 W.	[1] 31	8a, 1	1	994.9	NE	NNE, 10	WNW	NNW, 12	NE-NW.
Amapala, Hond. S. S.	New York	Kingston	35 47 N.	74 25 W.	1	10a, 1	1	1,003.4	NW	NW, 8	NW	NW, 8	NNE-NW.
Esso Baltimore, Am. S. S.	Boston	Corpus Christi	35 30 N.	71 20 W.	1	12m, 1	1	1,004.7	SE	S, 9	SSW	S, 9	SE-SSW.
Amazone, Du. S. S.	New York	Port au Prince	36 12 N.	71 18 W.	1	3p, 1	1	995.0	SE	SSW, 11	SW	S, 11	SE-SW.
Susan V. Luckenbach, Am. S. S.	New York	Christobal	37 50 N.	72 50 W.	1	4p, 1	1	[2]1,000.0	E	N, 12	NNW	N, 12	NE-NNW.
Northland, U. S. C. G.	Torgilsby	Julianehaab	59 38 N.	44 35 W.	1	8p, 1	1	995.6	NE	NNE, 7	NW	NE, 8	NE-NW.
Franklin K. Lane, Am. S. S.	New York	Corpus Christi	[3] 38 16½N.	70 32 W.	1	9p, 1	2	965.1	E	W, 8	WSW	WNW, 12	ESE-SW-WNW.
West Kebar, Am. S. S.	Freetown	Boston	30 42 N.	50 12 W.	4	4a, 5	5	1,016.6	SW	WSW, 4	WSW	SW, 8	SW-W.
Northland, U. S. C. G.	Ivigtut	Godhavn	68 30 N.	55 00 W.	6	3p, 7	8	1,006.4	S	S, 10	NW	SSE, 11	SSE-SSW.
J. A. Moffett, Jr., Am. S. S.	New York	Caripita	18 48 N.	63 36 W.	11	3p, 11	11	1,004.7	NW	WNW, 7	SW	W, 7	NW-W.
Meton, Am. S. S.	Curacao	Fall River	20 00 N.	68 30 W.	12	7p, 12	14	1,005.8	W	W, 7	SSW	SW, 8	
Borinquen, Am. S. S.	New York	San Juan	30 24 N.	71 00 W.	14	5p, 14	14	988.5	ENE	NNE, 12	W	NNE, 12	NE-N.
Coamo, Am. S. S.	San Juan	New York	30 14 N.	72 11 W.	14	11p, 14	15	989.5	SE	NW, 10	NNW	ENE, 11	ENE-NW.
President Roosevelt, Am. S. S.	New York	Bermuda	35 36 N.	70 54 W.	15	7p, 15	16	1,004.4	NNE	N, 9	NW	N, 9	N-NW.
Otho, Am. S. S.	Monrovia	New York	29 25 N.	46 30 W.	21	4a, 22	22	995.6	S	S, 9	W	SSW, 10	S-WSW.
Lobito, Port. S. S.	Lisbon	Philadelphia	36 38 N.	33 40 W.	23	11a, 23	24	977.0	S	SW, 12	NW	SW, 12	S-WNW.
Excambion, Am. S. S.	Bermuda	Lisbon	40 06 N.	31 42 W.	25	4a, 26	27	1,001.7	NNE	NE, 10	E	NNE, 10	NNE-E.
Astrea, Du. S. S.	Curacao	New York	32 18 N.	72 54 W.	26	7p, 26	27	1,013.5	NE	NE, 8	NE	NE, 8	SW-NE.
Malantic, Am. S. S.	Brunswick, Ga.	Philadelphia	35 03 N.	75 16 W.	27	2p, 30	[4] 1	1,006.4	NE	NNE, 10	NE	NNE, 10	
President Van Buren, Am. S. S.	Trinidad	New York	36 30 N.	72 42 W.	30	11p, 30	[4] 2	1,002.4	NE	NE, 9	NE	NE, 9	None.
NORTH PACIFIC OCEAN													
President Pierce, Am. S. S.	Hong Kong	Shanghai	26 00 N.	120 00 E.	[1] 31	[1] 5p. 31	1	984.1	W	W. 5	SE	SE, 10	W-N-SE.
Granville, Nor. M. S.	Los Angeles	Manila	18 07 N.	137 55 W.	4	2 p, 4	7	1,003.1	W	W, 5	WSW	WSW, 8	E-W.
Vacuum, Am. S. S.	Los Angeles	Vladivostok	43 50 N.	165 30 W.	5	11a, 5	6	992.2	S	S, 10	SW	SSE, 10	SSE-S.
San Luis Maru, Jap. M. S.	Los Angeles	Genzen	43 43 N.	173 55 W.	5	4p, 5	6	974.6	SW	SW, 8	WNW-WSW.	WSW, 9	WSW-SSW-WSW.
Crown City, Am. S. S.	Shanghai	Seattle	48 36 N.	176 24 E.	5	12p. 6	6	1,000.0	N	NNW, 6	N	N, 8	
Hie Maru, Jap. M. S.	Vancouver, B. C.	Yokahama	51 19 N.	168 30 W.	6	12m, 6	7	975.3	SE	SE, 8	SW	SE, 8	SSE-SE-SW.
Hoegh Silverstar, Nor. M. S.	San Francisco	Manila	20 42 N.	141 12 E.	5	7p, 6	7	987.6	NE	SW, 8	SW	SW, 9	None.
Steel Exporter, Am. S. S.	Belawan Deli	Honolulu	20 12 N.	131 26 E.	6	3a, 7	7	991.9	W	NNW, 8	W	WNW, 9	WNW-NE-WNW.
Aquarius, Am. S. S.	Bulan, P. I.	Los Angeles	19 30 N.	137 50 E.	7	9p, 7	8	980.0	SW	SW, 12	W	SW, 12	SSW-W.
Hoegh Silverstar, Nor. M. S.	San Francisco	Manila	19 24 N.	138 30 E.	7	11p, 7	8	974.3	SW	S, 10	SW	S, 11	SSW-S-WSW.
President Pierce, Am. S. S.	Yokohama	Honolulu	34 52 N.	142 00 E.	7	2a, 8	8	992.2	N	ENE, 8	S	ENE, 9	ENE-SE.
Explorer, U. S. C. & Geod. Survey.	On survey		52 42 B.	170 42 W.	11	4a, 12	12	999.7	SE	SSW, 7	SSW	SE, 9	SE-SW.
Collingsworth, Am. S. S.	Yokohama	Seattle	[3] 40 10 N.	150 12 E.	12	6p, 12	13	999.7	SE	NE, 8	N	ENE, 10	ENE-NE.
Explorer, U. S. C. & Geod. Survey.	On survey		52 48 N.	169 54 W.	13	1a, 14	14	996.3	SE	S, 8		S, 8	
Discoverer, U. S. C. & Geod. Survey.	On survey		55 30 N.	161 36 W.	14	12m, 14	15	1,001.4		Var., 5	WSW	WSW, 11	Var.-WSW.
Tweedbank, Br. M. S.	San Francisco	Manila	19 00 N.	146 20 E.	14	12p, 15	16	1,009.1	SE	SE, 10	SSW	SE, 10	ESE-SE.
Collingsworth, Am. S. S.	Yokohama	Seattle	49 35 N.	174 45 W.	17	6p, 17	18	1,019.3	NW	NW, 8	NW	NW, 8	WNW-NW.
District of Columbia, Am. S. S.	San Francisco	Nagaeva	49 36 N.	158 00 W.	17	10p, 17	18	1,001.7	SW	W, 10	W	W, 10	SW-W.
Discoverer, U. S. C. & Geod. Survey.	On survey		54 54 N.	162 24 W.	17	2p, 17	18	979.7		SSW, 7	W	WNW, 8	SSW-W.
District of Columbia, Am. S. S.	San Francisco	Nagaeva	49 54 N.	167 30 W.	20	10p, 20	23	971.6	S	WSW, 12	NW	WSW, 12	SW-WNW.
Collingsworth, Am. S. S.	Yokohama	Seattle	49 48 N.	147 30 W.	20	4p, 21	22	995.6	SSW	SSE, 9	SE	SSE, 9	SSE-S.
Bering, Am. S. S.	Hilo	Balboa	14 30 N.	110 00 W.	21	2a, 22	22	1,000.7	WSW	WSW, 6	SW	SW, 7	W-SW.
Southern Cross, Pan. s. yacht.	Los Angeles	Balboa	18 00 N.	112 45 W.	22	5p, 23	24	983.4	NE	WSW, 12	SSE	WSW, 12	NW-S.
La Placentia, Am. S. S.	Port San Luis	Balboa	15 41 N.	95 32 W.	27	4p, 27	28	1,006.8	NNE	NNE, 6	NNE	N, 7	NNE-N.

[1] August. [2] Barometer uncorrected. [3] Position approximate. [4] October.

WEATHER ON THE NORTH PACIFIC OCEAN

By WILLIS E. HURD

Atmospheric pressure.—Over the greater part of the North Pacific Ocean during September 1940, the average pressure was not far from normal. At St. Paul Island, in the Bering Sea, however, the average barometer, 1,003.1 millibars (29.62 inches), was 3.0 millibars (0.09 inch) below the normal; but this region of the Aleutian LOW is subject to sharp and irregular fluctuations. The same is true, but to a less extent, of the opposite center of action—the North Pacific HIGH—which often crests near Midway Island. At Midway this month the average pressure, 1,018.8 millibars (30.08 inches), was 2.5 millibars (0.07 inch) above the month's normal.

The most noticeable instance of abnormal pressure this month occurred over the Ogasawara (Bonin) Islands. The average at Titijima was 1,007.5 millibars (29.75 inches), which is 3.7 millibars (0.11 inch) below the normal. To the westward, Naha, in the Nansei Islands, had exactly normal pressure; to the southward, Guam had pressure 2.0 millibars (0.06 inch) below the normal. The considerable minus departure over the Ogasawaras and southward was due to several days of typhoon activity in the vicinity.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, September 1940, at selected stations*

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Millibars	*Millibars*	*Millibars*		*Millibars*	
Point Barrow	1,006.6	−5.9	1,019	10	995	18, 19
Dutch Harbor	1,004.8	−3.0	1,023	16	968	21
St. Paul	1,003.1	−3.0	1,020	27	979	7
Kodiak	1,004.4	−1.7	1,025	9	978	18
Juneau	1,013.2	0.0	1,028	30	995	15
Tatoosh Island	1,015.2	−0.7	1,024	19	1,006	17
San Francisco	1,013.9	0.0	1,020	27	1,009	17
Mazatlan	1,009.8	0.0	1,016	1	1,006	20
Honolulu	1,014.2	−1.7	1,017	1	1,010	17
Midway Island	1,018.8	+2.5	1,024	1, 2	1,010	28
Guam	1,008.2	−2.0	1,015	20	1,001	29
Manila	1,007.6	−0.5	1,012	21, 22	1,002	28, 29
Hong Kong	1,008.1	0.0	1,013	20	1,002	30
Naha	1,007.8	0.0	1,015	18, 19, 21	999	6, 7
Titijima	1,007.5	−3.7	1,017	21	964	6
Petropavlovsk	1,008.3	−1.9	1,027	21	992	28

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observations.

Extratropical cyclones.—Following a period of weak depressions and almost complete lack of gale winds in upper latitudes of the Pacific during July and August 1940, cyclones began to develop more intensity in September. Pressure over and to the southward of the Aleutians fell below 982 millibars (29 inches) on several days, and gales at times took on an almost wintry severity. Practically all, however, so far as reports indicate, occurred between the longitudes of 175° E. and 155° W. The only exception thus far charted was a gale of force 8 which, beginning from a southwesterly direction on the 20th, reached its highest intensity, force 9 from the south-southeast, near 50° N., 148° W., on the 21st.

On the 5th a cyclone of some energy appeared central near 45° N., 175° W. Strong winds were rather widespread on that day. The highest was a southerly gale of force 10, experienced by the American steamer *Vacuum* near 44° N., 165° W. The lowest barometer, 974.6 millibars (28.78 inches), was read on the Japanese motorship *San Luis Maru*, in the midst of a westerly gale of force 9, near 44° N., 174° W. The cyclone moved northward with continued low barometer, accompanied by fresh gales, during the 6th, and on the 7th had passed into Bering Sea.

During the 11th to 14th a stormy period was reported over the central Aleutians and lower Peninsula of Alaska by the Coast and Geodetic Survey steamships *Explorer* and *Discoverer*. Gales of force 9 were encountered among the islands on the 11th and 12th, but the heaviest gale, west-southwest, force 11, was felt by the *Discoverer* while cruising along the peninsula, in 55° 30′ N., 161° 36′ W.

A further stormy period occurred in Aleutian waters from the 17th to 22d, during which gale winds extended much farther eastward on the 21st, as previously noted. During this period occurred the most violent wind and the lowest barometer reported by a vessel for the month in northern waters, when, on the 20th, the American steamer *District of Columbia* encountered a west-southwesterly gale of force 12, barometer 971.6 millibars (28.69 inches), near 50° N., 168° W. On the same date an unnamed vessel reported a westerly gale of force 10, near 51° N., 177° W. On the 17th the *District of Columbia* faced a similar whole gale while near 50° N., 158° W. The lowest barometer recorded in northern waters during the month, 968 millibars (28.58 inches), occurred at Dutch Harbor on the 21st.

During the second decade of September several depressions occurred, central off the west coast of the United States, but do not appear to have been attended by winds of gale force.

Tropical cyclones.—Subjoined is a report by the Rev. Bernard F. Doucette, S. J., of the Weather Bureau, Manila, P. I., on five known typhoons, in addition to a possible further tropical storm near 18° N., 159° E., that occurred in Far East waters during the month. The winds in at least two of these typhoons, those of September 2–12 and of September 22 to October 2, reached hurricane intensity. The highest known velocity attained in the typhoon of the 11th to 15th was of force 10 from the southeast, reported by the British motorship *Tweedbank* near 19° N., 146° E., on the 15th.

Added comment may be made concerning the typhoon of the 2d to 12th which, then of high intensity, passed over the Ogasawaras (Bonins) on the 6th, and was central to the northwestward of the islands on the 7th and 8th, apparently between 25° and 30° N., and not far from 140° E. Between the hours of 9 p. m. on the 7th and 1 a. m. on the 8th, two ships, the American *Aquarius* and the Norwegian *Hoegh Silverstar*, encountered southerly to southwesterly winds of forces 11 to 12, with lowest barometer—on the *Hoegh Silverstar*—down to 974.3 millibars (28.77 inches). At midnight of the 7th–8th, far to the northward, near 35° N., 142° E., the steamer *President Pierce*, was facing an east-northeast gale of force 9, barometer 992.2 millibars (29.30 inches). The typhoon on those dates thus had a gale field of enormous extent. The final gales of the storm, before its disappearance from observation on the 13th, were encountered on the 12th, near 40° N., 150° E., by the American steamer *Collingsworth*. This ship's highest wind was of force 10 from east-northeast, at 4 p. m.

In the American Tropics two cyclones occurred, of which one was a hurricane. The earlier was encountered in the trade-wind belt by the Norweigian motorship *Granville*, Los Angeles toward Manila. On the afternoon of the 4th, near 18° N., 138° W., the ship had lowest barometer, 1,003.1 millibars (29.62 inches), with mostly west winds of force 5–6. The highest wind reported was west-southwest, force 8, on the 5th. The wind shifts in the disturbance, which was traveling westward, were from east to west.

First indications of the hurricane came from the American steamer *Bering*, Hilo toward Balboa. At 2 a. m. of September 22 the vessel reported her lowest barometer, 1,000.7 millibars (29.55 inches), in 14°30′ N., 110° W., and from 4 a. m. till noon, the highest wind, southwest, force 7. At local noon of the 22d the Panamanian steam yacht *Southern Cross*, south-bound toward Balboa, had falling barometer near 20° N., 110° W. The winds rose in the afternoon and by midnight were from east-northeast, force 9. During the forenoon of the 23d the northeasterly winds became increasingly heavy, rising to force 11 at noon, and driving the vessel off her course. In the afternoon, the winds were mostly of hurricane force, changing from north-northwest to west-southwest. The yacht's lowest barometer was 983.4 millibars (29.04 inches) in 18° N., 112°45′ W., at 5 p. m. Southerly winds of force 11 continued until after 4 a. m. of the 24th and then rapidly moderated. The hurricane, then over the Revillagigedo Islands, was apparently headed in a direction which would, if continued, have taken it well to the seaward of Lower California, but no later reports of its movements are available.

In the Gulf of Tehuantepec a northerly wind of force 7 was observed on the 27th.

Fog.—Along the open northern waters of the Pacific fog was scattered, but was reported on 6 days east and 6

days west of the 180th meridian. In American coastal waters fog was noted on 10 days each off Washington and California; on 4 days off Oregon; and on 3 days off Lower California.

TYPHOONS AND DEPRESSIONS OVER THE FAR EAST

By BERNARD F. DOUCETTE, S. J.

[Weather Bureau, Manila, P. I.]

Typhoon, August 28–September 5, 1940.—A low-pressure area far to the southeast of Guam moved west-northwest, rapidly developing to typhoon intensity as it proceeded. When the center reached the regions about 250 miles west of Guam, the direction changed to the northwest, and the storm continued along this course until it reached the latitude of southern Formosa. It shifted its movement to the west for 1 day (September 4) and disappeared east or east-southeast of Ishigakijima after a short inclination to the northwest.

Typhoon, September 2–12, 1940.—A low-pressure area appeared far to the east-northeast of Guam, moved west-northwest and became a typhoon, September 2, located about 300 miles north-northeast of Guam. It continued moving west-northwest, gradually inclining to the north-northwest, and passed about 90 miles southwest of the Bonins during the early morning hours of September 7, after shifting to the west-northwest. A change to the north occurred which brought the storm center to the ocean regions between the Bonins and Japan, September 9. It seemed to be stationary during the day, due to a high-pressure area over northern Japan and the Pacific Ocean. September 10, however, showed the center moving west-southwest, and it is thought that instead of being stationary on the preceding day, the center may have made a loop before moving toward the west-southwest. Over the ocean regions south of Japan, the typhoon changed to the northwest, a course which brought it to Kiu-siu Island. September 11, the storm recurved to the northeast over this island and on the following day it had weakened, apparently to a low pressure area which moved northeast across Japan.

The afternoon observation, September 6, from the Bonins, was the lowest in the series reported from that island during this storm. Pressure was 723.0 mm. (963.9 mb.) with north-northeast winds of force 12. From latitude 29° N., longitude 134° E., on the morning of September 10, a ship, name unknown, reported west winds, force 11, with pressure at 729.0 mm. (971.9 mb.).

While this storm was in progress, an observation was received from a ship, name unknown, in latitude 17°54′ N., longitude 158°48′ E., with west winds of force 8 and pressure at 996.2 mb. (September 7). This indicated the existence of a typhoon far to the east-northeast of Guam, but no other evidence was received either from that ship or other ships, to show its origin and progress. It is possible that there may have been a communication error and that the position given was wrong, but there is no way to check this at present.

Typhoon, September 6–7, 1940.—This typhoon must be considered in connection with the typhoon of August 28 to September 5, for it is possible that it might be the same disturbance. Until further evidence is received, it will be treated as a separate typhoon, which was central about 600 miles east of southern Formosa, September 6, and which then curved northwest, north, and northeast for 1 day, after which it weakened to a depression and then disappeared. No trace of the storm could be found on September 8. The observations which made this storm appear to be independent of the typhoon of August 28–September 5, are the following: The S. S. *Steel Exporter* reported 0700 G. C. T. September 6, from latitude 20°18′ N., longitude 129°30′E., a pressure of 744.8 mm. (993.0 mb.) with west-northwest winds of force 9. Also, the morning observation, September 6, from Rasa Jima Island (one of the Nansei Island group) was 747.8 mm. (997.0 mb.) for pressure and east-northeast, force 4, for winds.

Typhoon, September 11–19, 1940.—A depression, moving westerly, passed about 200 miles south of Guam and quickly inclined to the north, intensifying to typhoon strength, September 11 to 13. It was stationary, September 13 and 14, about 150 miles west-northwest of Guam, and then began a northwesterly and northerly course to the ocean regions about 300 miles west of the Bonins, where it recurved to the north-northeast and moved very rapidly toward the northern Pacific Ocean. The morning observation received from Hatidyozima Island, September 18, was 737.3 mm. (983.0 mb.) with north-northeast winds, force 7, which shows better than any other available observation what intensity the storm had reached.

Typhoon, September 22–October 2, 1940.—This storm first appeared far to the south-southeast of Guam and seemed to be a fully developed typhoon, September 22. It moved along a course in general west-northwest, but varying to the northwest and west for short periods. It finally reached the eastern part of the Balintang Channel, September 29, and passed close to and north of Basco late in the afternoon of that day. It inclined to the northwest apparently, and moved close to and west of Formosa Island toward China. It is believed that the center did not cross any portion of Formosa but observations are needed to be certain. After crossing Formosa Channel the center entered the continent within 100 miles northeast of Amoy, inclining to the north. Over land, the storm weakened and recurved to the northeast and entered the Eastern Sea about 150 miles south of Shanghai as a mild depression which quickly disappeared.

The only part of the Philippine Archipelago affected by this typhoon was the Batan Islands. Basco, the location of the Weather Bureau station, reported a minimum pressure of 723.61 mm. (964.7 mb.) with northwest winds of force 12, September 29, at 6:45 p. m. No loss of life and no serious damage was reported.

Only during this typhoon was there any strength in the upper winds over the Philippines, and the velocities did not increase to values above 50 k. p. h. until September 28 and 29. First increasing at Cebu and Zamboanga from the southwest quadrant, then a day later at Manila, Dagupan, and Aparri, as the directions changed from the northwest and north quadrants to the southwest, it seemed that the southwest air stream was drawn toward the typhoon center. This activity did not extend south or southwest of Zamboanga, according to available data, for there was no increase in the velocities of the southwest monsoon over Bandon, Thailand, and Saigon, Indo-China. Compared with other typhoons, for example, those of July 2–9 and July 6–16, 1940, whose centers moved along courses similar to that of September 22–October 2, there was a very great difference in the activity of the southwest monsoon.

During the July typhoons Cebu and Manila had velocities up to and over 100 k. p. h. and stations over southern Indo-China and Thailand were almost always reporting velocities over 50 k. p. h., often reaching 80 and 90 k. p. h. This typhoon situation had characteristics much different than that during the last few days of

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